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| **Lesson Title: Sea-Floor Spreading** |
| **Subject area / course / grade level: Science/ 4th grade** |
| **Introduction: Sea floor spreading is a means by which the earth’s tectonic plates are constantly moving and changing the Earth’s crust. As the sea floor spreads apart at one point, the sea floor subducts at an opposite point, thus creating new magma in the Earth’s mantle.** |
| **Lesson Length: 1 hour** |
| **Materials: Four crayons of different colors, two large sheets of paper, two desks that can be pushed together and pulled apart, a map of ocean basins, videos (Discovery Education videos *The Ocean Floor* and *The Sea Floor Is Spreading,* and Brain Pop *There’s a Floor in the Ocean?)* internet images of sea floor spreading** |
| **Lesson Overview: This lesson is to be done after students have a rudimentary grasp of how plate tectonics affect the development of mountain ranges, volcanoes, and earthquakes. Many students fail to recognize that topography varies not only on land, but also under the sea. This activity will illustrate that the oceanic crust is also varied and active.** |
| **Tennessee Standards: 4th Grade**  **GLE 0407.Inq.3 Organize data into appropriate tables, graphs, drawings, or diagrams**  **GLE 0407.Inq.4 Identify and interpret simple patterns of evidence to communicate the findings of multiple investigations.**  **GLE 0407.Inq.5 Recognize that people may interpret the same results in different ways.** |
| **Lesson objective(s): To help students understand the concept of captured magnetism directions on the sea floor that provides evidence of sea floor spreading over time.** |
| **ENGAGEMENT**   1. Ask students to imagine they are in a deep submersible submarine, and to describe what they think the   ocean floor looks like. Is it flat, or are there any mountain ranges and valleys?  2) Show the students an actual map of the ocean floor. Tell them that the ocean floor is the last real unexplored  frontier on Earth.   1. Ask students if they see any patterns in the ocean floor topography. This is a good time to talk about how   The recognition of patterns in nature (i.e. observations about nature) is an important part of the process of  scientific discovery.  **Students should ask themselves:**  1) How does this model help explain the widening of the ocean basins?  2) What technology do geologists use to prove sea-floor spreading?  3) What features on the ocean floor does the model explain? |
| **EXPLORATION**  Students will turn two desks so that they are facing each other and almost touching. Each student should  take a piece of paper and place them together in the slight gap between the desks as far down as  they can go while still having a grip on the paper. Students will practice pulling both papers out of the desk at  the same time and at the same rate of movement (this is the spreading ridge). Students should each  pull their own paper toward themselves, so that the effect is like the new crust forming and then  spreading out from the ridge. Once that is accomplished, each student should take a different colored crayon. Start with a little bit of paper showing. Following your directions, both students very slowly pull the  paper out at the same rate, have one student color both pieces of paper along the ridge with one  crayon, so that there is a strip of color parallel to the ridge. This color represents rocks that are  formed with their magnetic minerals facing toward a magnetic pole that is in the north (normal  polarity). When the magnetic pole has faded and then shifts to the south (reversed polarity), the second student should take the second crayon and make the same type of strip of color. Students will continue to change directions at your instruction. (This will demonstrate reversed polarity and geologic age of the Earth’s crust.) When the exercise is complete, ask students to explain what has been demonstrated. |
| **EXPLANATION**  Ask students to discuss and describe how the evidence of reversed polarity and geologic age of the rocks gives credence to sea- floor spreading.  Ask students to describe the evidence of sea floor spreading and how it will continue to spread. |
| **ELABORATION**  Ask the students to discuss and describe the mirror image effect they see on the two sheets of paper. Have them discuss what may happen to the sea-floor at the other end of the rift. Why does the sea-floor not continue to grow wider and wider? Guide students to relate this to the rock cycle, magma, and mantle. |
| **EVALUATION**  Students will demonstrate a level of understanding of the material through observed and written evidence.  Student pairs will tape the papers together down the center (what would be the middle of the ocean ridge) and  label the following:  (I) the rift zone  (2) where the oldest rocks are located  (3) where the youngest rocks are located |